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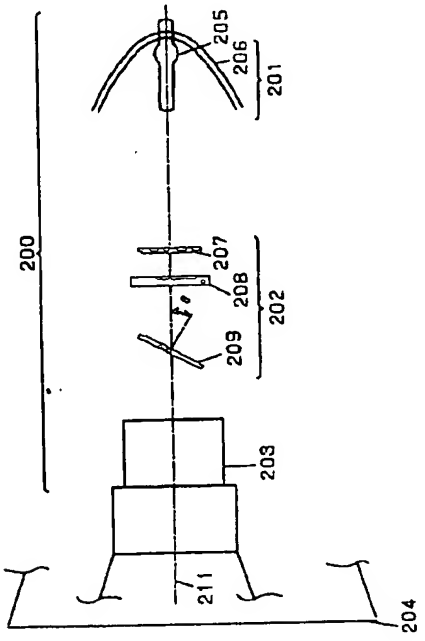
(54)【発明の名称】　投写型画像表示装置

(57)【要約】
【課題】　偏光を利用した透過型ライトバルブによる投写型画像表示装置においてライトバルブ周辺の発熱に対する信頼性向上を目的とする。
【解決手段】　光源からのランダム光を入射側偏光板で一方向の偏光光に規制した後、ライトバルブで画素毎に偏光方向を制御し、出射側偏光板でこの偏光光の一偏光方向についてのみ透過する事で画像表示を行いこれを投写レンズで拡大透写する。このとき出射側偏光板は反射型偏光板であり、しかもライトバルブ面に対し傾いて備えられていることでライトバルブ、出射側偏光板周辺での発熱を抑えることを可能とし、これによる信頼性の低下を抑えられる。またこの間を密閉して防塵構造を取ることでゴミによる画像劣化を抑えることが出来る。



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【特許請求の範囲】

【請求項１】　光源部と、前記光源部からの光のうち任意の偏光方向の光のみを透過する入射側偏光板と、複数の画素開口部を持ち外部よりの入力信号に応じて前記入射側偏光板を経て入射する光の偏光方向を画素毎に制御可能な透過型液晶パネルと、前記透過型液晶パネルからの出射光のうちを任意の偏光方向の光のみを透過する出射側偏光板と、前記透過型液晶パネル上の画像を拡大投写可能に投写レンズを備えており、前記出射側偏光板は任意の直線偏光の光だけを透過し、他を反射する反射型偏光板であり、しかもその反射面は前記透過型液晶パネルに対し傾けて配置されていることを特徴とする投写型画像表示装置。

【請求項２】　光源部と、前記光源部からの光のうち任意の偏光方向の光のみを透過する入射側偏光板と、複数の画素開口部を持ち外部よりの入力信号に応じて前記入射側偏光板を経て入射する光の偏光方向を画素毎に制御可能な透過型液晶パネルと、前記透過型液晶パネルからの出射光のうちを任意の偏光方向の光のみを透過する出射側偏光板と、前記透過型液晶パネル上の画像を拡大投写可能に投写レンズを備えており、前記出射側偏光板は前記透過型液晶パネルに配置された反射型偏光板と前記投写レンズ側に配置された吸収型偏光板とからなり、前記反射型偏光板は任意の直線偏光の光だけを透過し、他を反射する特性を有し、しかもその反射面は前記透過型液晶パネルに対し傾けて配置されていることを特徴とする投写型画像表示装置。

【請求項３】　前記透過型液晶パネルを透過し、反射型偏光板で反射された光は前記透過型液晶パネルの有効部に再入射しないように反射型偏光板は角度設定されて支持されていることを特徴とする請求項１、２記載の投写型画像表示装置。

【請求項４】　前記透過型液晶パネルの出射面には反射防止処理が施されており、空気層を挟んで反射型偏光板表面が対向するよう構成されていることを特徴とする請求項１、２記載の投写型画像表示装置。

【請求項５】　前記透過型液晶パネルと反射型偏光板表面間は密閉されて防塵構造が構成されていることを特徴とする請求項４記載の投写型画像表示装置。

【請求項６】　前記透過型液晶パネルと反射型偏光板間は高屈折材料で満たされて構成されていることを特徴とする請求項１、２記載の投写型画像表示装置。

【請求項７】　前記反射型偏光板と前記吸収型偏光板は別々の平行平面板に添付されており、透過型液晶パネルに対し傾けて配置されている前記反射型偏光板に対し前記透過型偏光板は９０度ねじれるように傾けて配置されていることを特徴とする請求項２記載の投写型画像表示装置。

【請求項８】　前記透過型液晶パネルの出射面と反射型偏光板の入射側に位相軸を直交させてλ／４板が設けられていることを特徴とする請求項１、２記載の投写型画像表示装置。

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【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は光の偏光方向を利用して画像表示する透過型液晶ライトバルブを用いた投写型画像表示装置に関するものである。

【０００２】

【従来の技術】透過型液晶ライトバルブを用いた投写型画像表示装置は小型、軽量、設置調整不要という特徴からプレゼンテーション用途など市場を大きく拡大しつつある。更に近年は偏光方向変換光学系の導入により同じ光源を用いても理想的には光利用率を倍増、あるいは液晶パネル近傍に設けたマイクロレンズによりパネル開口率を改善することでの光利用率向上、光源のショートアーク化による集光効率の向上などにより対角長１．３インチパネルを用い従来の小型、軽量はそのままに１０００ルーメン等の高輝度化を実現しつつあり、今後の更なる市場拡大にこの高輝度化の取り組みは更に拍車がかかるものと考えられる。

【０００３】しかしながら今以上の高輝度化を図るには偏光板、特に出射側偏光板の信頼性を確保することが課題となる。

【０００４】図１１は従来の投写型画像表示装置の概略基本構成図である。投写型画像表示装置１００はシステム光軸に沿って光源部１０１から射出された光は液晶パネルユニット１０２に入射し、ここで変調された後投写レンズ１０３を経てスクリーン１０４に至る。

【０００５】光源部１０１は光源１０５と、リフレクター１０６とからなり、光源から出射される偏光方向がランダムな偏光光は液晶パネルユニット１０２に入射する。

【０００６】液晶パネルユニット１０２は入射側偏光板１０７、透過型液晶パネル１０８、出射側偏光板１０９からなっている。図１２に液晶パネルユニット１０２の構成を示す。入射側偏光板１０７は透過型液晶パネル１０８と平行に配置された支持用ガラス基盤１１０に貼り付けられている。

【０００７】この入射側偏光板１０７は図１２で示す矩形の外形形状の短手方向の偏光方向の光を透過し、これに直交する偏光方向の光を吸収するように設定されている吸収型偏光板である。入射側偏光板１０７を透過した光は透過型液晶パネル１０８に入射する。この透過型液晶パネル１０８は外部信号により多数の各画素開口毎に透過光の偏光方向を変えることが出来る。

【０００８】ここでは各画素を駆動しない場合には偏光方向が９０度回転せしめられ、駆動した場合には偏光方向の変化無く透過するものとする。出射側偏光板１０９は透過型液晶パネル１０８の出射面に貼り付けて支持されている。出射側偏光板１０９は入射側偏光板１０７と

直交した方向の偏光特性を有する吸収型偏光板である。

【０００９】従って透過型液晶パネル１０８が偏光方向を９０度変えて透過した画素部の光の偏光方向は出射側偏光板１０９の透過軸と一致するためここを透過する。一方透過型液晶パネル１０８が偏光方向を変えずに透過した画素部の光の偏光方向は出射側偏光板１０９の透過軸と直交するためここで吸収される。このようにして液晶パネルユニット１０２で変調された光は投写レンズ１０３を経てスクリーン１０４に至る。この従来例では白黒表示であるが基本的にカラー表示は各色光について独立して同様の原理で入射光を変調して画像表示するものである。

【００１０】

【発明が解決しようとする課題】しかしこの原理に基づく投写型画像表示装置において高輝度化を進めるにあたっては偏光板の光吸収による発熱が問題になる。ここで入射側偏光板は偏光変換光学系の導入やプリ偏光板（偏光度は優れないが予備偏光として熱負担を分散）を併用する事であらかじめおよそ偏光方向が限定された光を用いることで更なる高輝度化の対して対応可能であるが、出射側偏光板についてはプリ偏光板の併用などで多少負担軽減も考えられないことはないが連続した黒表示の際などは発熱が顕著になり偏光性能を維持できなくなり画像劣化を余儀なくされる。

【００１１】近年この光吸収型偏光板の弱点を改善した反射型偏光板が開発され、一部の商品には既に前記入射側プリ偏光が導入されている。この反射型偏光板は一方向の偏光光を透過し、これに直交する偏光光を反射するため光吸収が少なく、従って発熱による信頼性欠如が生じにくいことが特徴である。

【００１２】ただしこの反射型偏光板を従来の出射側偏光板に置き換えて用いると反射された不要光が再度液晶パネルに裏面から入射することで光電効果が生じ、画像劣化を生じせしめることから、出射側偏光板については更なる高輝度化に対し有効な信頼性確保の手だてが無かった。

【００１３】また、出射側検光子として偏光板でなく偏光ビームスプリッターを出射側に配置した場合は、前記発熱の問題はないが偏光ビームスプリッターは蒸着膜をプリズムで挟んだ構成となっていることからコストアップと共に空間を必要とするため、小型で携帯性を要求される液晶ライトバルブを用いた投写型画像表示装置には実用的ではなかった。

【００１４】

【課題を解決するための手段】前記課題を解決するために第１の発明による投写型画像表示装置は光源部と、前記光源部からの光のうち任意の偏光方向の光のみを透過する入射側偏光板と、複数の画素開口部を持ち外部よりの入力信号に応じて前記入射側偏光板を経て入射する光の偏光方向を画素毎に制御可能な透過型液晶パネルと、

前記透過型液晶パネルからの出射光のうちを任意の偏光方向の光のみを透過する出射側偏光板と、前記透過型液晶パネル上の画像を拡大投写可能に投写レンズを備えており、前記出射側偏光板は任意の直線偏光の光だけを透過し、他を反射する反射型偏光板であり、しかもその反射面は前記透過型液晶パネルに対し傾けて配置されていることを特徴とする。

【００１５】あるいは同じく前記課題を解決するために第２の発明による投写型画像表示装置は光源部と、前記光源部からの光のうち任意の偏光方向の光のみを透過する入射側偏光板と、複数の画素開口部を持ち外部よりの入力信号に応じて前記入射側偏光板を経て入射する光の偏光方向を画素毎に制御可能な透過型液晶パネルと、前記透過型液晶パネルからの出射光のうちを任意の偏光方向の光のみを透過する出射側偏光板と、前記透過型液晶パネル上の画像を拡大投写可能に投写レンズを備えており、前記出射側偏光板は前記透過型液晶パネルに配置された反射型偏光板と前記投写レンズ側に配置された吸収型偏光板とからなり、前記反射型偏光板は任意の直線偏光の光だけを透過し、他を反射する特性を有し、しかもその反射面は前記透過型液晶パネルに対し傾けて配置されていることを特徴とする。

【００１６】上記両発明とも前記透過型液晶パネルを透過し、反射型偏光板で反射された光は前記透過型液晶パネルの有効部に再入射しないように反射型偏光板は角度設定されて支持されていることを特徴とする。

【００１７】または上記両発明において前記透過型液晶パネルの出射面には反射防止処理が施されており、空気層を挟んで反射型偏光板表面が対向するよう構成されていることを特徴とする。さらにここで前記透過型液晶パネルと反射型偏光板表面間は密閉されて防塵構造が構成されていることで防塵効果を得ることが出来る。

【００１８】上記両発明において前記透過型液晶パネルと反射型偏光板間は高屈折材料で満たされて構成されていることを特徴とすることで界面反射除去、防塵効果を得る。　特に前記第２の発明においては前記反射型偏光板と前記吸収型偏光板は別々の平行平面板に添付されており、透過型液晶パネルに対し傾けて配置されている前記反射型偏光板に対し前記透過型偏光板は９０度ねじれるように傾けて配置されていることを特徴とする。

【００１９】前記両発明において前記透過型液晶パネルの出射面と反射型偏光板の入射側に位相軸を直交させてλ／４板が設けられていることを特徴とする。

【００２０】

【発明の実施の形態】本発明による投写型画像表示装置は液晶パネルからの出射光のうち不要光を光路からはずして除去するためパネルへの裏面入射による光電効果による画質劣化無く、信頼性を確保することが出来る。合わせて液晶パネルと出射側偏光板との間を密閉、あるいは高屈折材で満たすことで防塵効果も得ることが出来

る。

【００２１】（実施の形態１）図１は実施の形態１の概略構成図である。本例の投写型画像表示装置２００はシステム光軸に沿って光源部２０１から射出された光は液晶パネルユニット２０２に入射し、ここで変調された後投写レンズ２０３を経てスクリーン２０４に至る。

【００２２】光源部２０１は光源２０５と、リフレクター２０６とからなり、光源から出射される偏光方向がランダムな偏光光はリフレクター２０６によって一方向に反射され、液晶パネルユニット２０２に入射する。このリフレクター２０６の反射面の形状は放物面でも、楕円面でも、球面でも光学系の設計により使用できる。

【００２３】液晶パネルユニット２０２は入射側偏光板２０７、透過型液晶パネル２０８、出射側偏光板２０９からなっている。図２に液晶パネルユニット２０２の構成を示す。入射側偏光板２０７は透過型液晶パネル２０８と平行に支持用ガラス基盤２１０に貼り付けられている。この入射側偏光板２０７は図２で示す矩形の外形形状の短手方向の偏光方向の光を透過し、これに直交する偏光方向の光を反射するように設定されている反射型偏光板である。

【００２４】入射側偏光板２０７を透過した光は透過型液晶パネル２０８に入射する。この透過型液晶パネル２０８は外部信号により多数の各画素開口毎に透過光の偏光方向を変えることが出来る。ここでは各画素を駆動しない場合には偏光方向が９０度回転せしめられ、駆動した場合には偏光方向の変化無く透過するものとする。

【００２５】出射側偏光板２０９はシステム光軸２１１に対して角度θをもって傾いて支持された支持用ガラス基盤２１２に貼り付けられている。出射側偏光板２０９は入射側偏光板２０７と直交した方向の偏光特性を有する反射型偏光板である，従って透過型液晶パネル２０８が偏光方向を９０度変えて透過した画素部の光の偏光方向は出射側偏光板２０９の透過軸と一致するためここを透過する。

【００２６】一方透過型液晶パネル２０８が偏光方向を変えずに透過した画素部の光の偏光方向は出射側偏光板２０９の透過軸と直交するためここで反射される。この際反射された光は再度透過型液晶パネル２０８に入射しない位置に到達するように先の角度θは設定されている。このようにして液晶パネルユニット２０２で変調された光は投写レンズ２０３を経てスクリーン２０４に至る。この実施の形態では白黒表示であるが基本的にカラー表示は各色光について独立して同様の原理で入射光を変調して画像表示すれば対応可能なことは言うまでもない。

【００２７】このように本実施例に依れば光源部２０１からの出力が大きくなった際にも画質を損なうことなく出射側偏光板２０９での光吸収はほとんどなく構成できることから信頼性を確保することが出来る。

【００２８】ここで透過型液晶パネル２０８への裏面からの戻り光による光電効果による画像劣化を防ぐ必要性から、透過型液晶パネル２０８の出射面には反射防止処理が施されていることが望ましい。同じ理由から第１のλ／４板を透過型液晶パネル２０８の出射面に貼り付け、この第１のλ／４板と反射型偏光子の間に前記第１のλ／４板と位相軸が直交するように設定された第２のλ／４板を設けてもよい。

【００２９】この構成において透過型液晶パネル２０８と出射側偏光板２０９とを図３にあるように密閉して外部からのゴミ、異物の付着を防ぐ防塵構造２１３を取ることで、画質維持、メンテナンスフリーを実現できる。これは本発明が透過型液晶パネル２０８と出射側偏光板２０９が離れて互いの熱が分散され、しかも出射側偏光板２０９が熱吸収のない反射型偏光板であることから先に示した信頼性向上と同時に実現することが出来る。またゴミが出射側偏光板２０９の透過型液晶パネル２０８側と反対側に付着しても投写レンズ２０３のピント面である透過型液晶パネル２０８から離れているのでゴミとして認識されることなく実用上問題なくなる。ただしこの実施の形態においては透過型液晶パネル２０８の入射側偏光板２０７側は別途防塵手段を備える必要がある。

【００３０】さらに図４にあるように図３の構成において透過型液晶パネル２０８と出射側偏光板２０９の間をガラスやエチレングレコール等の液体、シリコン等のゲル状の高屈折材料２１４で満たすことで透過型液晶パネル２０８の出射面からの戻り光による光電効果による画像劣化を防ぐことが出来る。このとき高屈折材料が機械的に強度があるものであれば図にある防塵構造２１３は必ずしも必要性はない。

【００３１】ただしこのとき生じる光学的な収差が無視できないものであれば、図５にあるように出射側偏光板２０９の出射側に透過型液晶パネル２０８に平行に出射面に反射防止処理を施した平行平面板２１５を配置し、この平行平面板２１５から透過型液晶パネル２０８までを前記高屈折材料２１４で満たすことで解決できる。

【００３２】また最初に示した透過型液晶パネル２０８と出射側偏光板２０９との間は空気である場合でも出射側偏光板２０９を支持する支持用ガラス基盤２１２がシステム光軸２１１に対して角度θをもって傾いて支持されていることから非点収差が生じる。この発生が問題になる場合には図６にあるように前記出射側偏光板２０９を支持する支持用ガラス基盤２１２の傾きに対して９０度ねじれた方向に傾いて支持された平行平面板である収差補正ガラス２１６を配置することでキャンセルすることが出来る。これは支持用ガラス基盤２１２、収差補正ガラス２１６それぞれが発生する非点収差を略同程度として相殺するものであることから、収差発生量が同じになるように板厚、屈折率、傾きを設定すればよいのは明らかである。

【００３３】（実施の形態２）図７は実施の形態２の概略構成図である。本例の投写型画像表示装置３００はシステム光軸に沿って光源部２０１から射出された光は液晶パネルユニット３０１に入射し、ここで変調された後投写レンズ２０３を経てスクリーン２０４に至る。

【００３４】光源部２０１は光源２０５と、リフレクター２０６とからなり、光源から出射される偏光方向がランダムな偏光光はリフレクター２０６によって一方向に反射され、液晶パネルユニット３０１に入射する。このリフレクター２０６の反射面の形状は放物面でも、楕円面でも、球面でも光学系の設計により使用できる。

【００３５】液晶パネルユニット３０１は入射側偏光板２０７、透過型液晶パネル２０８、出射側偏光板３０２からなっている。図８に液晶パネルユニット３０１の構成を示す。入射側偏光板２０７は透過型液晶パネル２０８と平行に支持用ガラス基盤２１０に貼り付けられている。この入射側偏光板２０７は図８で示す矩形の外形形状の短手方向の偏光方向の光を透過し、これに直交する偏光方向の光を反射するように設定されている反射型偏光板である。

【００３６】入射側偏光板２０７を透過した光は透過型液晶パネル２０８に入射する。この透過型液晶パネル２０８は外部信号により多数の各画素開口毎に透過光の偏光方向を変えることが出来る。ここでは各画素を駆動しない場合には偏光方向が９０度回転せしめられ、駆動した場合には偏光方向の変化無く透過するものとする。

【００３７】出射側偏光板３０２はシステム光軸２１１に対して角度θをもって傾いて支持された支持用ガラス基盤２１２に貼り付けられた反射型偏光板３０３と前記反射型偏光板３０３を透過した光が角度を持たず垂直に入射するように支持された支持用ガラス基盤３０４に貼り付けられた吸収型偏光板３０５からなっている。反射型偏光板３０３、吸収型偏光板３０５は入射側偏光板２０７と直交した方向の偏光特性を有している。

【００３８】従って透過型液晶パネル２０８が偏光方向を９０度変えて透過した画素部の光の偏光方向は出射側偏光板３０２の透過軸と一致するためここを透過する。一方透過型液晶パネル２０８が偏光方向を変えずに透過した画素部の光の偏光方向は出射側偏光板３０２の透過軸と直交するためここで反射される。この際反射された光は再度透過型液晶パネル２０８に入射しない位置に到達するように先の角度θは設定されている。

【００３９】このようにして液晶パネルユニット３０１で変調された光は投写レンズ２０３を経てスクリーン２０４に至る。この実施の形態では白黒表示であるが基本的にカラー表示は各色光について独立して同様の原理で入射光を変調して画像表示すれば対応可能なことは言うまでもない。

【００４０】このように本実施例に依れば光源部２０１からの出力が大きくなった際にも画質を損なうことなく出射側偏光板３０２で従来発熱の原因であった不要光の吸収はほとんどなく反射型偏光板で除去する構成をとることから信頼性を確保することが出来る。

【００４１】本実施の形態に依れば反射型偏光板３０３を吸収型偏光板３０５のプリ偏光板として予備偏光を行うために用い、最終的な偏光性能は吸収型偏光板３０５で決めているため、ここではフィルム状の反射型偏光板３０３を用いて説明したが必ずしもその必要性はなく、平行平面板の両側にＴｉO2 のような高屈折材料層を備えてなる高い偏光度は望みにくいが比較的安価で耐熱性の優れたものでも置き換えることが可能となる。

【００４２】本実施の形態において吸収型偏光板３０５は入射光に対して垂直に配置したが必ずしもその必要はなく、傾けて備えることも可能である。このようにすれば吸収型偏光板３０５の入射面、出射面においての反射光が再度透過型液晶パネル２０８に入射しなくなることから光電効果による画質劣化を抑えることが出来る。

【００４３】もちろん前記透過型液晶パネル２０８への裏面からの戻り光による光電効果による画像劣化を防ぐ必要性から、透過型液晶パネル２０８の出射面には反射防止処理が施されていることが望ましい。同じ理由から第１のλ／４板を透過型液晶パネル２０８の出射面に貼り付け、この第１のλ／４板と反射型偏光子の間に前記第１のλ／４板と位相軸が直交するように設定された第２のλ／４板を設けてもよい。

【００４４】この構成において透過型液晶パネル２０８と反射型偏光板３０３とを図９にあるように密閉して外部からのゴミ、異物の付着を防ぐ防塵構造２１３を取ることで、画質維持、メンテナンスフリーを実現できる。これは本発明が透過型液晶パネル２０８と反射型偏光板３０３が離れて互いの熱が分散され、しかも出射側偏光板が熱吸収のない反射型偏光板であることから先に示した信頼性向上と同時に実現することが出来る。またゴミが反射型偏光板３０３の透過型液晶パネル２０８側と反対側に付着しても投写レンズ２０３のピント面である透過型液晶パネル２０８から離れているのでゴミとして認識されることなく実用上問題なくなる。ただしこの実施の形態においては透過型液晶パネル２０８の入射側偏光板２０７側は別途防塵手段を備える必要がある。

【００４５】さらに図４と同様に図９の構成において透過型液晶パネル２０８と反射型偏光板３０３との間をガラスやエチレングレコール等の液体、シリコン等のゲル状の高屈折材料２１４で満たすことで透過型液晶パネル２０８の出射面からの戻り光による光電効果による画像劣化を防ぐことが出来る。このとき高屈折材料が機械的に強度があるものであれば図にある防塵構造２１３は必ずしも必要性はない。

【００４６】ただしこのとき生じる光学的な収差が無視できないものであれば、図５にあるものと同様に出射側偏光板２０９の出射側に透過型液晶パネル２０８に平行

に出射面に反射防止処理を施した平行平面板２１５を配置し、この平行平面板２１５から透過型液晶パネル２０８までを前記高屈折材料２１４で満たす構造を構成し、同様な効果を得られることは言うまでもない。

【００４７】また最初に示した透過型液晶パネル２０８と反射型偏光板３０３との間は空気である場合でも反射型偏光板３０３を支持する支持用ガラス基盤２１２がシステム光軸２１１に対して角度θをもって傾いて支持されていることから非点収差が生じる。この発生が問題になる場合には図１０にあるように前記出射側偏光板２０９を支持する支持用ガラス基盤２１２の傾きに対して９０度ねじれた方向に傾けて吸収側偏光板３０５を支持する支持用ガラス基盤３０４を配置することでキャンセルすることが出来る。当然実施の形態１のように収差補正ガラス２１６を追加配置することでもキャンセルすることが出来る。

【００４８】

【発明の効果】以上のように本発明の投写型画像表示装置では、基本的に出射側偏光板に反射型偏光板を用いて、透過型ライトバルブに対して傾けて構成することにより、パネルへの裏面入射による光電効果が招く画質劣化無く、基本的に熱吸収がない上に透過型ライトバル出射側偏光板を離しておくことで熱の発生場所を分散できることから熱放出性に優れることから高信頼性を確保することが出来る。

【００４９】合わせて液晶パネルと出射側偏光板との間を密閉、あるいは高屈折材で満たすことで防塵効果も得ることが出来る。これにより投写画面に現れるゴミによる欠陥や輝度低下などを防止できる上に、製造上で必ずしもレベルの高いクリーンルームが必要でなくなることから取り扱いが容易になる。

【図面の簡単な説明】

【図１】実施の形態１の構成図

【図２】実施の形態１の液晶パネルユニット構成図（１）

【図３】実施の形態１の透過型液晶パネルユニット部防塵構造説明図（１）

【図４】実施の形態１の透過型液晶パネルユニット部防塵構造説明図（２）

【図５】実施の形態１の透過型液晶パネルユニット部防塵構造説明図（３）

【図６】実施の形態１の液晶パネルユニット構成図（２）

【図７】実施の形態２の構成図

【図８】実施の形態２の液晶パネルユニット構成図（１）

【図９】実施の形態１の透過型液晶パネルユニット部防塵構造説明図

【図１０】実施の形態２の液晶パネルユニット構成図（２）

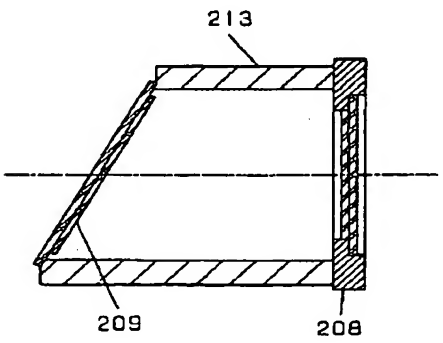
【図１１】従来の投写型画像表示装置の概略基本構成図

【図１２】従来の投写型画像表示装置の液晶パネルユニット構成図

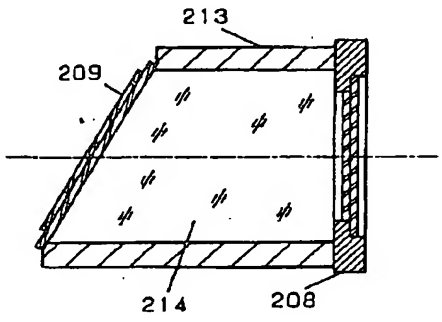
【符号の説明】

１００、２００、３００　投写型画像表示装置
１０１、２０１　光源部
１０２、２０２、３０１　液晶パネルユニット
１０３、２０３　投写レンズ
１０４、２０４　スクリーン
１０５、２０５　光源
１０６、２０６　リフレクター
１０７、２０７　入射側偏光板
１０８、２０８　透過型液晶パネル
１０９、２０９、３０２　出射側偏光板
１１０、２１０、２１２、３０４　支持用ガラス基盤
２１１　システム光軸
２１３　防塵構造
２１４　高屈折材料
２１５　平行平面板
２１６　収差補正ガラス
３０３　反射型偏光板
３０５　吸収型偏光板

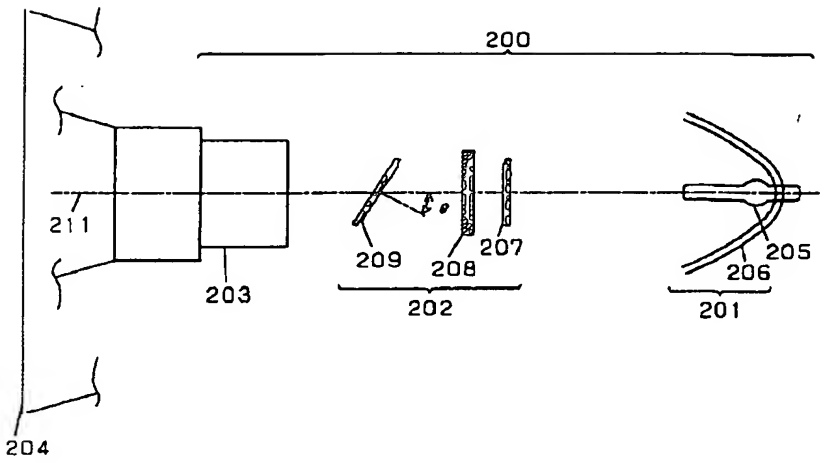
【図３】



【図４】



【図1】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211
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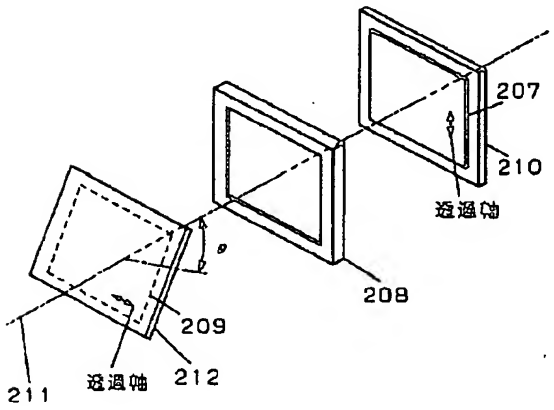
【図2】


207
210
透過軸
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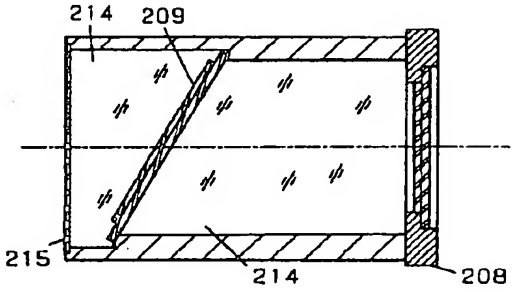
209
211
透過軸
212

【図5】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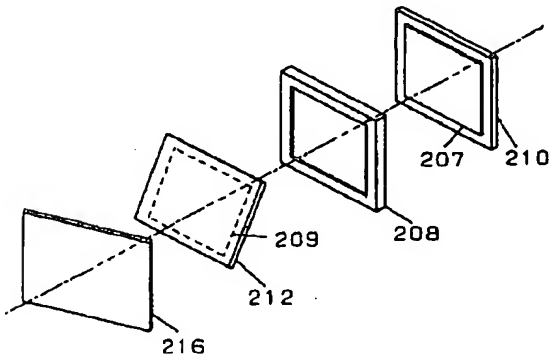
【図6】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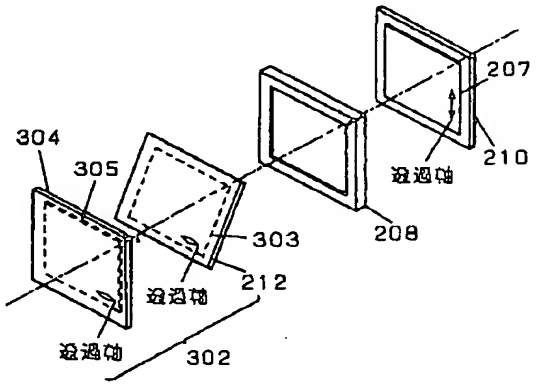
216

【図8】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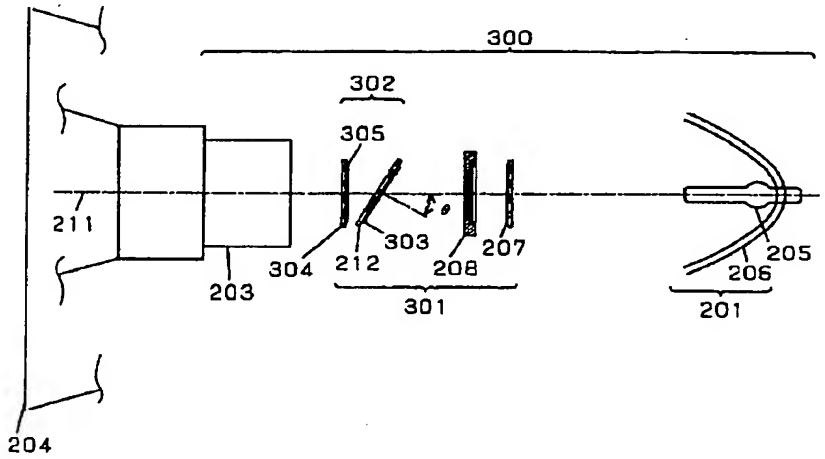
305
207
210
透過軸
208
303
212
透過軸
透過軸
302

【図７】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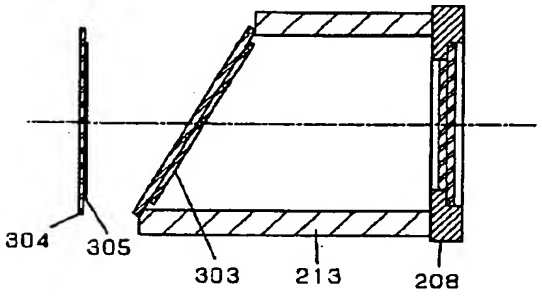
206
203
301
201
204

【図９】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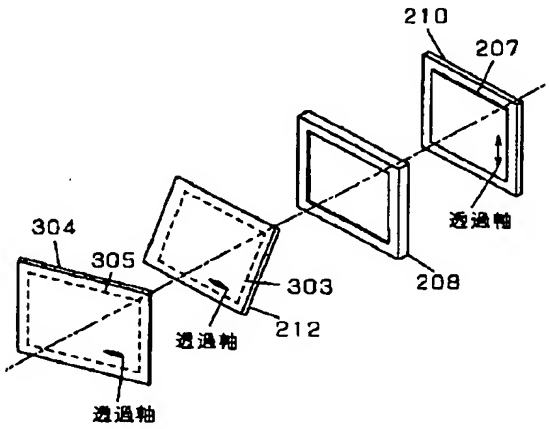
303
213
208

【図１０】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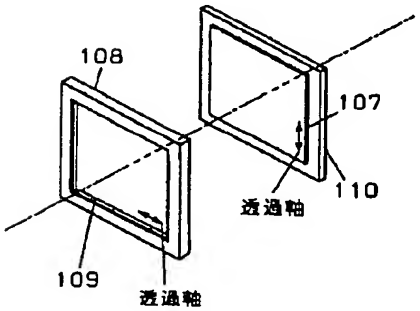
透過軸
304
305
303
208
212
透過軸
透過軸

【図１２】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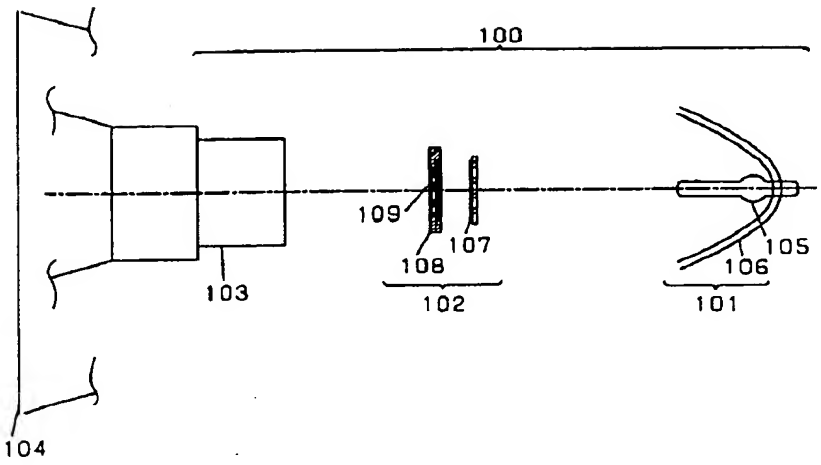
107
110
透過軸
109
透過軸

【図１１】



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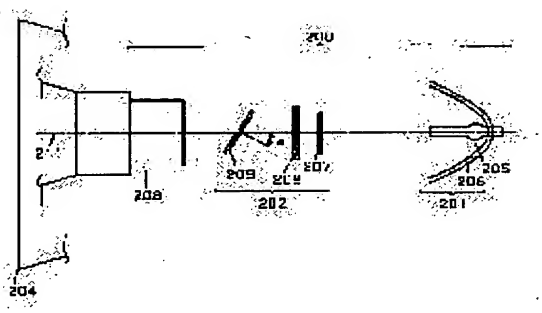
(54) PROJECTION PICTURE DISPLAY

(57)Abstract:

PROBLEM TO BE SOLVED: To enhance reliability against heat generated around a light bulb in a transmission projection picture display constituted of the light bulb utilizing polarized light.

SOLUTION: This projection picture display 200 is constituted so that a picture is displayed by regulating random light emitted from a light source 205 to unidirectional polarized light by an incident-side polarizing plate 207, controlling the polarizing direction thereof for each pixel by the light bulb and transmitting the polarized light only in one polarizing direction by an emitting-side polarizing plate 209, enlarged and projected by a projection lens 203. Since the plate 209 is a reflection polarizing plate and inclined with respect to the surface of the light bulb, heat is suppressed from being generated near the light bulb and the plate 209. Thus, deterioration of reliability is suppressed. Besides, the deterioration of a picture caused by dusts is suppressed by applying a dust-proof structure by hermetically sealing a gap between them.



LEGAL STATUS

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[Date of final disposal for application]

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[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The light source section and the incidence side polarizing plate which penetrates only the light of the arbitrary polarization directions among the light from the aforementioned light source section, The polarization direction of the light which carries out incidence through the aforementioned incidence side polarizing plate according to the input signal from the exterior with two or more pixel openings A penetrated type liquid crystal panel controllable for every pixel, The outgoing radiation side polarizing plate which penetrates only the light of the arbitrary polarization directions for the inside of the outgoing radiation light from the aforementioned penetrated type liquid crystal panel, It has the projection lens possible [expansion projection of the picture on the aforementioned penetrated type liquid crystal panel]. The reflector is projected type image display equipment characterized by being the reflected type polarizing plate which the aforementioned outgoing radiation side polarizing plate penetrates only the light of the arbitrary linearly polarized lights, and reflects others, leaning [as opposed to / the aforementioned penetrated type liquid crystal panel / moreover], and being arranged.
[Claim 2] It is projected type image display equipment which it has the following, and the aforementioned reflected type polarizing plate penetrates only the light of the arbitrary linearly polarized lights, has the property of reflecting others, and is moreover characterized by leaning and arranging the reflector to the aforementioned penetrated type liquid crystal panel. Light source section The incidence side polarizing plate which penetrates only the light of the arbitrary polarization directions among the light from the aforementioned light source section It is a penetrated type liquid crystal panel controllable for every pixel about the polarization direction of the light which carries out incidence through the aforementioned incidence side polarizing plate according to the input signal from the exterior with two or more pixel openings. It is the absorbed type polarizing plate which is equipped with the projection lens possible [expansion projection of the outgoing radiation side polarizing plate which penetrates only the light of the arbitrary polarization directions for the inside of the outgoing radiation light from the aforementioned penetrated type liquid crystal panel, and the picture on the aforementioned penetrated type liquid crystal panel], and has been arranged at the aforementioned reflected type polarizing plate [with which the aforementioned outgoing radiation side polarizing plate has been arranged at the aforementioned penetrated type liquid crystal panel], and projection lens side.
[Claim 3] The light which penetrated the aforementioned penetrated type liquid crystal panel, and was reflected with the reflected type polarizing plate is the claim 1 and the projected type image display equipment of two publications which are characterized by carrying out an angle setup and supporting the reflected type polarizing plate so that there may be no reentry putting to the effective section of the aforementioned penetrated type liquid crystal panel.
[Claim 4] The claim 1, projected type image display equipment of two publications which are characterized by being constituted so that acid-resisting processing may be performed to the outgoing radiation side of the aforementioned penetrated type liquid crystal panel and a reflected type polarizing plate front face may counter on both sides of an air space.
[Claim 5] It is projected type image display equipment according to claim 4 characterized by being sealed and constituting the dustproof structure between the aforementioned penetrated type liquid crystal panel and a reflected type polarizing plate front face.

[Claim 6] It is the claim 1 and the projected type image display equipment of two publications which are characterized by being filled with high refraction material and consisting of them between the aforementioned penetrated type liquid crystal panel and a reflected type polarizing plate.
[Claim 7] The aforementioned penetrated type polarizing plate is projected type image display equipment according to claim 2 characterized by being leaned and arranged so that it can twist 90 degrees to the aforementioned reflected type polarizing plate which the aforementioned reflected type polarizing plate and the aforementioned absorbed type polarizing plate are appended to the separate plane-parallel plate, leans them to a penetrated type liquid crystal panel, and is arranged.
[Claim 8] The claim 1, projected type image display equipment of two publications which are characterized by making a phase shaft intersect perpendicularly and forming lambda/4 board in the outgoing radiation side [of the aforementioned penetrated type liquid crystal panel], and incidence side of a reflected type polarizing plate.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the projected type image display equipment using the penetrated type liquid crystal light valve which carries out image display using the polarization direction of light.
[0002]
[Description of the Prior Art] The projected type image display equipment using the penetrated type liquid crystal light valve is expanding commercial scenes, such as a presentation use, greatly from the feature of small, lightweight, and installation adjustment needlessness. Furthermore, even if it uses the same light source by introduction of polarization directional change optical system in recent years, an optical utilization factor is doubled ideally. Or the improvement in an optical utilization factor by improving a panel numerical aperture by the micro lens prepared near the liquid crystal panel, improvement in the condensing efficiency by short-arc-izing of the light source etc. -- the 1.3 inches panel of diagonal length -- using -- small [conventional] and lightweight ** -- high brightness-ization of 1000 etc. lumens etc. is realized as it is, and, as for the measure of this raise in brightness, a spur is further considered to be this thing by the further future commercial-scene expansion
[0003] However, it becomes a technical problem to secure the reliability of a polarizing plate, especially an outgoing radiation side polarizing plate for attaining high brightness-ization more than now.
[0004] Drawing 11 is the outline basic block diagram of conventional projected type image display equipment. Projected type image display equipment 100 carries out incidence of the light injected from the light source section 101 along with the system optical axis to the liquid crystal panel unit 102, and results in a screen 104 through the post-projection lens 103 modulated here.
[0005] The light source section 101 consists of the light source 105 and a reflector 106, and carries out incidence of the polarization light with the random polarization direction by which outgoing radiation is carried out from the light source to the liquid crystal panel unit 102.
[0006] The liquid crystal panel unit 102 consists of the incidence side polarizing plate 107, a penetrated type liquid crystal panel 108, and an outgoing radiation side polarizing plate 109. The composition of the liquid crystal panel unit 102 is shown in drawing 12 . The incidence side polarizing plate 107 is stuck on the glass base 110 for support arranged in parallel with the penetrated type liquid crystal panel 108.
[0007] This incidence side polarizing plate 107 is an absorbed type polarizing plate set up so that the light of the polarization direction which penetrates the light of the polarization direction of the direction of a short hand of the appearance configuration of the rectangle shown by drawing 12 , and intersects perpendicularly with this may be absorbed. Incidence of the light which penetrated the incidence side polarizing plate 107 is carried out to the penetrated type liquid crystal panel 108. This penetrated type liquid crystal panel 108 can change the polarization direction of the transmitted light for a majority of every pixel openings by the external signal.
[0008] Here, when not driving each pixel, the polarization direction is made to rotate 90 degrees, and when it drives, it shall penetrate without change of the polarization direction. The outgoing radiation side polarizing plate 109 is stuck on the outgoing radiation side of the penetrated type liquid crystal panel 108, and is supported. The outgoing radiation side polarizing plate 109 is an absorbed type polarizing plate which

has the polarization property of the direction which intersected perpendicularly with the incidence side polarizing plate 107.
[0009] Therefore, since the polarization direction of the light of the pixel section where the penetrated type liquid crystal panel 108 changed the polarization direction 90 degrees, and penetrated it is in agreement with the transparency shaft of the outgoing radiation side polarizing plate 109, it penetrates this. On the other hand, since the transparency shaft of the outgoing radiation side polarizing plate 109 and the polarization direction of the light of the pixel section which the penetrated type liquid crystal panel 108 penetrated, without changing the polarization direction cross at right angles, it is absorbed here. Thus, the light modulated in the liquid crystal panel unit 102 results in a screen 104 through the projection lens 103. In this conventional example, although it is monochrome display, color display modulates and carries out independently image display of the incident light by the same principle about each colored light fundamentally.
[0010]
[Problem(s) to be Solved by the Invention] However, in advancing high brightness-ization in the projected type image display equipment based on this principle, generation of heat by the optical absorption of a polarizing plate becomes a problem. Although the further high brightness-ization receives and an incidence side polarizing plate can respond by using the light to which the polarization direction was limited about beforehand here by using together introduction and the pulley polarizing plate (it distributing a heat burden as preliminary polarization although degree of polarization is not excellent) of polarization conversion optical system In case it is the black display which continued although derating was not somewhat considered by combined use of a pulley polarizing plate etc. about an outgoing radiation side polarizing plate, either, generation of heat becomes remarkable, and it becomes impossible to maintain polarizability, and it is obliged to picture degradation.
[0011] The reflected type polarizing plate which has improved the weak point of this optical-absorption type polarizing plate is developed in recent years, and the aforementioned incidence side pulley polarization is already introduced into some goods. Since this reflected type polarizing plate reflects the polarization light which penetrates Mukai's polarization light on the other hand, and intersects perpendicularly with this, it has few optical absorptions, therefore it is the feature that it is hard to produce the reliability lack by generation of heat.
[0012] However, the photoelectric effect arose because the unnecessary light reflected when this reflected type polarizing plate was replaced and used for the conventional outgoing radiation side polarizing plate carries out incidence to a liquid crystal panel from a rear face again, and since it produced and cheated out of picture degradation, about an outgoing radiation side polarizing plate, there were no means of effective reliability reservation to the further raise in brightness.
[0013] Moreover, although there was no problem of the aforementioned generation of heat when not a polarizing plate but the polarization beam splitter had been arranged to the outgoing radiation side as an outgoing radiation side analyzer, since the polarization beam splitter had composition which sandwiched the vacuum evaporationo film by prism and it needed space with a cost rise, it was small and was not practical to the projected type image display equipment using the liquid crystal light valve of which portability is required.
[0014]
[Means for Solving the Problem] The projected type image display equipment by the 1st invention in order to solve the aforementioned technical problem The light source section, The incidence side polarizing plate which penetrates only the light of the arbitrary polarization directions among the light from the aforementioned light source section, The polarization direction of the light which carries out incidence through the aforementioned incidence side polarizing plate according to the input signal from the exterior with two or more pixel openings A penetrated type liquid crystal panel controllable for every pixel, The outgoing radiation side polarizing plate which penetrates only the light of the arbitrary polarization directions for the inside of the outgoing radiation light from the aforementioned penetrated type liquid crystal panel, It is the reflected type polarizing plate which it has the projection lens possible [expansion

projection of the picture on the aforementioned penetrated type liquid crystal panel], and the aforementioned outgoing radiation side polarizing plate penetrates only the light of the arbitrary linearly polarized lights, and reflects others, and is characterized by moreover leaning and arranging the reflector to the aforementioned penetrated type liquid crystal panel.

[0015] The projected type image display equipment by the 2nd invention in order to solve the aforementioned technical problem similarly Or the light source section, The incidence side polarizing plate which penetrates only the light of the arbitrary polarization directions among the light from the aforementioned light source section, The polarization direction of the light which carries out incidence through the aforementioned incidence side polarizing plate according to the input signal from the exterior with two or more pixel openings A penetrated type liquid crystal panel controllable for every pixel, The outgoing radiation side polarizing plate which penetrates only the light of the arbitrary polarization directions for the inside of the outgoing radiation light from the aforementioned penetrated type liquid crystal panel, It has the projection lens possible [expansion projection of the picture on the aforementioned penetrated type liquid crystal panel]. The aforementioned outgoing radiation side polarizing plate consists of a reflected type polarizing plate arranged at the aforementioned penetrated type liquid crystal panel, and an absorbed type polarizing plate arranged at the aforementioned projection lens side. The aforementioned reflected type polarizing plate penetrates only the light of the arbitrary linearly polarized lights, and it has the property of reflecting others, and is characterized by moreover leaning and arranging the reflector to the aforementioned penetrated type liquid crystal panel.

[0016] Light in which both the above-mentioned invention penetrated the aforementioned penetrated type liquid crystal panel, and was reflected with the reflected type polarizing plate is characterized by carrying out an angle setup and supporting the reflected type polarizing plate so that there may be no reentry putting to the effective section of the aforementioned penetrated type liquid crystal panel.

[0017] Or in both the above-mentioned invention, acid-resisting processing is performed to the outgoing radiation side of the aforementioned penetrated type liquid crystal panel, and it is characterized by being constituted so that a reflected type polarizing plate front face may counter on both sides of an air space. Furthermore, the protection-against-dust effect can be acquired with it being sealed here between the aforementioned penetrated type liquid crystal panel and a reflected type polarizing plate front face, and the dustproof structure being constituted.

[0018] Interface reflective removal and the protection-against-dust effect are acquired by it being characterized by filling and consisting of high refraction material in both the above-mentioned invention between the aforementioned penetrated type liquid crystal panel and a reflected type polarizing plate. Especially in the 2nd aforementioned invention, the aforementioned reflected type polarizing plate and the aforementioned absorbed type polarizing plate are appended to the separate plane-parallel plate, and the aforementioned penetrated type polarizing plate is characterized by being leaned and arranged so that it can twist 90 degrees to the aforementioned reflected type polarizing plate leaned and arranged to the penetrated type liquid crystal panel.

[0019] It is characterized by making a phase shaft intersect perpendicularly and forming lambda/4 board in the outgoing radiation side [of the aforementioned penetrated type liquid crystal panel], and incidence side of a reflected type polarizing plate in both the aforementioned invention.

[0020]

[Embodiments of the Invention] The projected type image display equipment by this invention does not have quality-of-image degradation by the photoelectric effect by the rear-face incidence to a panel in order to remove and remove unnecessary light from an optical path among the outgoing radiation light from a liquid crystal panel, and it can secure reliability. The protection-against-dust effect can also be acquired by doubling and filling between a liquid crystal panel and outgoing radiation side polarizing plates with sealing or high refraction material.

[0021] (Gestalt 1 of operation) Drawing 1 is the outline block diagram of the gestalt 1 of operation. The projected type image display equipment 200 of this example carries out incidence of the light injected from the light source section 201 along with the system optical axis to the liquid crystal panel unit 202, and

results in a screen 204 through the post-projection lens 203 modulated here.
[0022] The light source section 201 consists of the light source 205 and a reflector 206, and on the other hand, it is reflected in ** by the reflector 206, and it carries out incidence of the polarization light with the random polarization direction by which outgoing radiation is carried out from the light source to the liquid crystal panel unit 202 with it. The configuration of the reflector of this reflector 206 can also use a paraboloid, an ellipsoid, or the spherical surface by the design of optical system.
[0023] The liquid crystal panel unit 202 consists of the incidence side polarizing plate 207, a penetrated type liquid crystal panel 208, and an outgoing radiation side polarizing plate 209. The composition of the liquid crystal panel unit 202 is shown in drawing 2 . The incidence side polarizing plate 207 is stuck on the glass base 210 for support in parallel with the penetrated type liquid crystal panel 208. This incidence side polarizing plate 207 is a reflected type polarizing plate set up so that the light of the polarization direction which penetrates the light of the polarization direction of the direction of a short hand of the appearance configuration of the rectangle shown by drawing 2 , and intersects perpendicularly with this may be reflected.
[0024] Incidence of the light which penetrated the incidence side polarizing plate 207 is carried out to the penetrated type liquid crystal panel 208. This penetrated type liquid crystal panel 208 can change the polarization direction of the transmitted light for a majority of every pixel openings by the external signal. Here, when not driving each pixel, the polarization direction is made to rotate 90 degrees, and when it drives, it shall penetrate without change of the polarization direction.
[0025] The outgoing radiation side polarizing plate 209 is stuck on the glass base 212 for support inclined and supported with the angle theta to the system optical axis 211. The outgoing radiation side polarizing plate 209 is a reflected type polarizing plate which has the polarization property of the direction which intersected perpendicularly with the incidence side polarizing plate 207. Therefore, since the polarization direction of the light of the pixel section where the penetrated type liquid crystal panel 208 changed the polarization direction 90 degrees, and penetrated it is in agreement with the transparency shaft of the outgoing radiation side polarizing plate 209, it penetrates this.
[0026] On the other hand, since the transparency shaft of the outgoing radiation side polarizing plate 209 and the polarization direction of the light of the pixel section which the penetrated type liquid crystal panel 208 penetrated, without changing the polarization direction cross at right angles, it is reflected here. Under the present circumstances, the previous angle theta is set up so that the reflected light may arrive at the position which does not carry out incidence to the penetrated type liquid crystal panel 208 again. Thus, the light modulated in the liquid crystal panel unit 202 results in a screen 204 through the projection lens 203. Although it is monochrome display with the gestalt of this operation, color display cannot be fundamentally overemphasized by that it can respond if image display of the incident light is modulated and carried out independently by the same principle about each colored light.
[0027] Thus, without spoiling quality of image, when depending on this example and the output from the light source section 201 becomes large, since there is almost no optical absorption in the outgoing radiation side polarizing plate 209 and it can be constituted, it can secure reliability.
[0028] It is desirable to perform acid-resisting processing to the outgoing radiation side of the penetrated type liquid crystal panel 208 from the need of preventing picture degradation by the photoelectric effect by the return light from the rear face to the penetrated type liquid crystal panel 208 here. Since it is the same, the 1st lambda/4 board may be stuck on the outgoing radiation side of the penetrated type liquid crystal panel 208, and you may form the 2nd lambda/4 board set up so that lambda/4 board and phase shaft of the above 1st might intersect perpendicularly between this 1st lambda/4 board and a reflected type polarizer.
[0029] Quality-of-image maintenance and maintenance-free one are realizable by taking the dustproof structure 213 which seals the penetrated type liquid crystal panel 208 and the outgoing radiation side polarizing plate 209 in this composition as shown in drawing 3 , and prevents adhesion of the dust from the outside and a foreign matter. The penetrated type liquid crystal panel 208 and the outgoing radiation side polarizing plate 209 separate, mutual heat is distributed, and this invention can realize this simultaneously

with the improvement in reliability previously shown from it being the reflected type polarizing plate which moreover does not have heat absorption of the outgoing radiation side polarizing plate 209. Moreover, it becomes practically satisfactory, without being recognized as dust, since it is separated from the penetrated type liquid crystal panel 208 which is the focus side of the projection lens 203 even if dust adheres to an opposite side the penetrated type liquid crystal panel 208 side of the outgoing radiation side polarizing plate 209. However, in the form of this operation, the incidence side polarizing plate 207 side of the penetrated type liquid crystal panel 208 needs to be separately equipped with a protection-against-dust means.

[0030] Picture degradation by the photoelectric effect by the return light from the outgoing radiation side of the penetrated type liquid crystal panel 208 can be prevented by filling between the penetrated type liquid crystal panel 208 and the outgoing radiation side polarizing plates 209 with the high refraction material 214 of gels, such as liquids, such as glass and ethylene GUREKORU, and silicon, in the composition of drawing 3, as furthermore shown in drawing 4. If intensity has quantity refraction material mechanically at this time, the dustproof structure 213 in drawing will not not necessarily have need.

[0031] However, if the optical aberration produced at this time cannot be disregarded, as shown in drawing 5, the plane-parallel plate 215 which performed acid-resisting processing to the outgoing radiation side of the outgoing radiation side polarizing plate 209 in parallel with the penetrated type liquid crystal panel 208 in the outgoing radiation side is arranged, and it can solve by filling from this plane-parallel plate 215 to the penetrated type liquid crystal panel 208 with the aforementioned quantity refraction material 214.

[0032] Moreover, between the penetrated type liquid crystal panel 208 shown first and the outgoing radiation side polarizing plate 209, since the glass base 212 for support which supports the outgoing radiation side polarizing plate 209 inclines and is supported with the angle theta to the system optical axis 211 even when it is air, astigmatism arises. When this generating becomes a problem, it can cancel by arranging the aberration amendment glass 216 which is the plane-parallel plate which inclined in the direction twisted 90 degrees to the inclination of the glass base 212 for support which supports the aforementioned outgoing radiation side polarizing plate 209 as shown in drawing 6, and was supported. this -- the glass base 212 for support, and aberration amendment glass 216 -- the astigmatism which each generates -- abbreviation -- since each other is offset as of the same grade, it is clear that what is necessary is just to set up board thickness, a refractive index, and an inclination so that an aberration yield may become the same

[0033] (Form 2 of operation) Drawing 7 is the outline block diagram of the form 2 of operation. The projected type image display equipment 300 of this example carries out incidence of the light injected from the light source section 201 along with the system optical axis to the liquid crystal panel unit 301, and results in a screen 204 through the post-projection lens 203 modulated here.

[0034] The light source section 201 consists of the light source 205 and a reflector 206, and on the other hand, it is reflected in ** by the reflector 206, and it carries out incidence of the polarization light with the random polarization direction by which outgoing radiation is carried out from the light source to the liquid crystal panel unit 301 with it. The configuration of the reflector of this reflector 206 can also use a paraboloid, an ellipsoid, or the spherical surface by the design of optical system.

[0035] The liquid crystal panel unit 301 consists of the incidence side polarizing plate 207, a penetrated type liquid crystal panel 208, and an outgoing radiation side polarizing plate 302. The composition of the liquid crystal panel unit 301 is shown in drawing 8. The incidence side polarizing plate 207 is stuck on the glass base 210 for support in parallel with the penetrated type liquid crystal panel 208. This incidence side polarizing plate 207 is a reflected type polarizing plate set up so that the light of the polarization direction which penetrates the light of the polarization direction of the direction of a short hand of the appearance configuration of the rectangle shown by drawing 8, and intersects perpendicularly with this may be reflected.

[0036] Incidence of the light which penetrated the incidence side polarizing plate 207 is carried out to the penetrated type liquid crystal panel 208. This penetrated type liquid crystal panel 208 can change the polarization direction of the transmitted light for a majority of every pixel openings by the external signal.

Here, when not driving each pixel, the polarization direction is made to rotate 90 degrees, and when it drives, it shall penetrate without change of the polarization direction.

[0037] The outgoing radiation side polarizing plate 302 consists of an absorbed type polarizing plate 305 stuck on the glass base 304 for support supported so that the light which penetrated the reflected type polarizing plate 303 and the aforementioned reflected type polarizing plate 303 which were stuck on the glass base 212 for support inclined and supported with the angle theta to the system optical axis 211 might carry out incidence perpendicularly without an angle. The reflected type polarizing plate 303 and the absorbed type polarizing plate 305 have the polarization property of the direction which intersected perpendicularly with the incidence side polarizing plate 207.

[0038] Therefore, since the polarization direction of the light of the pixel section where the penetrated type liquid crystal panel 208 changed the polarization direction 90 degrees, and penetrated it is in agreement with the transparency shaft of the outgoing radiation side polarizing plate 302, it penetrates this. On the other hand, since the transparency shaft of the outgoing radiation side polarizing plate 302 and the polarization direction of the light of the pixel section which the penetrated type liquid crystal panel 208 penetrated, without changing the polarization direction cross at right angles, it is reflected here. Under the present circumstances, the previous angle theta is set up so that the reflected light may arrive at the position which does not carry out incidence to the penetrated type liquid crystal panel 208 again.

[0039] Thus, the light modulated in the liquid crystal panel unit 301 results in a screen 204 through the projection lens 203. Although it is monochrome display with the gestalt of this operation, color display cannot be fundamentally overemphasized by that it can respond if image display of the incident light is modulated and carried out independently by the same principle about each colored light.

[0040] Thus, without spoiling quality of image, when depending on this example and the output from the light source section 201 becomes large, since the unnecessary absorption of light which caused generation of heat conventionally in the outgoing radiation side polarizing plate 302 takes the composition which is not almost and is removed with a reflected type polarizing plate, it can secure reliability.

[0041] Since the reflected type polarizing plate 303 was used in order to perform preliminary polarization as a pulley polarizing plate of the absorbed type polarizing plate 305 and final polarizability is decided with the absorbed type polarizing plate 305, if it depends on the gestalt of this operation, Although here explained using the film-like reflected type polarizing plate 303, the need does not not necessarily exist, and it is TiO2 to the both sides of a plane-parallel plate. Although it is hard to desire high degree of polarization which comes to have a high refraction material layer [like], it becomes it is comparatively cheap and possible [also replacing the heat-resistant outstanding thing].

[0042] Although the absorbed type polarizing plate 305 has been perpendicularly arranged to an incident light in the gestalt of this operation, it is also not necessarily possible for the need not to exist, and to lean and have. If it does in this way, since the reflected light in the plane of incidence of the absorbed type polarizing plate 305 and an outgoing radiation side will not carry out incidence to the penetrated type liquid crystal panel 208 again, quality-of-image degradation by the photoelectric effect can be suppressed.

[0043] It is desirable to perform acid-resisting processing to the outgoing radiation side of the penetrated type liquid crystal panel 208 from the need of, of course preventing picture degradation by the photoelectric effect by the return light from the rear face to the aforementioned penetrated type liquid crystal panel 208. Since it is the same, the 1st lambda/4 board may be stuck on the outgoing radiation side of the penetrated type liquid crystal panel 208, and you may form the 2nd lambda/4 board set up so that lambda/4 board and phase shaft of the above 1st might intersect perpendicularly between this 1st lambda/4 board and a reflected type polarizer.

[0044] Quality-of-image maintenance and maintenance-free one are realizable by taking the dustproof structure 213 which seals the penetrated type liquid crystal panel 208 and the reflected type polarizing plate 303 in this composition as shown in drawing 9 , and prevents adhesion of the dust from the outside and a foreign matter. The penetrated type liquid crystal panel 208 and the reflected type polarizing plate 303 separate, mutual heat is distributed, and this invention can realize this simultaneously with the improvement in reliability previously shown from it being the reflected type polarizing plate which moreover

does not have heat absorption of an outgoing radiation side polarizing plate. Moreover, it becomes practically satisfactory, without being recognized as dust, since it is separated from the penetrated type liquid crystal panel 208 which is the focus side of the projection lens 203 even if dust adheres to an opposite side the penetrated type liquid crystal panel 208 side of the reflected type polarizing plate 303. However, in the gestalt of this operation, the incidence side polarizing plate 207 side of the penetrated type liquid crystal panel 208 needs to be separately equipped with a protection-against-dust means.

[0045] Picture degradation by the photoelectric effect by the return light from the outgoing radiation side of the penetrated type liquid crystal panel 208 can be prevented by filling between the penetrated type liquid crystal panel 208 and the reflected type polarizing plates 303 with the high refraction material 214 of gels, such as liquids, such as glass and ethylene GUREKORU, and silicon, in the composition of drawing 9 still like drawing 4 . If intensity has quantity refraction material mechanically at this time, the dustproof structure 213 in drawing will not not necessarily have need.

[0046] However, if the optical aberration which produces at this time cannot be disregarded, it cannot be overemphasized that the plane-parallel plate 215 which performed acid-resisting processing in parallel with the penetrated type liquid crystal panel 208 to the outgoing-radiation side of the outgoing-radiation side polarizing plate 209 like the thing in drawing 5 in the outgoing-radiation side arranges, the structure fill from this plane-parallel plate 215 to a penetrated type liquid crystal panel 208 with the aforementioned quantity refraction material 214 constitutes, and the same effect can acquire.

[0047] Moreover, between the penetrated type liquid crystal panels 208 and the reflected type polarizing plates 303 which were shown first, since the glass base 212 for support which supports the reflected type polarizing plate 303 inclines and is supported with the angle theta to the system optical axis 211 even when it is air, astigmatism arises. When this generating becomes a problem, it can cancel by arranging the glass base 304 for support which leans in the direction which was able to be twisted 90 degrees to the inclination of the glass base 212 for support which supports the aforementioned outgoing radiation side polarizing plate 209 as shown in drawing 10 , and supports the absorption side polarizing plate 305. Carrying out additional arrangement of the aberration amendment glass 216 like the gestalt 1 of operation naturally can also cancel.

[0048]

[Effect of the Invention] By using a reflected type polarizing plate for an outgoing radiation side polarizing plate fundamentally, leaning and constituting from projected type image display equipment of this invention to a penetrated type light valve, as mentioned above, there is no quality-of-image degradation which the photoelectric effect by the rear-face incidence to a panel causes, and since the generating place of heat can be distributed by heat absorption turning up fundamentally and detaching a penetrated type light BAL outgoing radiation side polarizing plate and it excels in heat-dissipation nature, high-reliability is securable.

[0049] The protection-against-dust effect can also be acquired by doubling and filling between a liquid crystal panel and outgoing radiation side polarizing plates with sealing or high refraction material. By the ability preventing upwards a defect, a brightness fall, etc. by the dust which appears on a projection screen by this, it is on manufacture, and since the clean room where level is high is necessarily less necessary, handling becomes easy.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram of the gestalt 1 of operation
[Drawing 2] The liquid crystal panel unit configuration view of the gestalt 1 of operation (1)
[Drawing 3] Penetrated type liquid crystal panel unit section dustproof-structure explanatory drawing of the gestalt 1 of operation (1)
[Drawing 4] Penetrated type liquid crystal panel unit section dustproof-structure explanatory drawing of the gestalt 1 of operation (2)
[Drawing 5] Penetrated type liquid crystal panel unit section dustproof-structure explanatory drawing of the gestalt 1 of operation (3)
[Drawing 6] The liquid crystal panel unit configuration view of the gestalt 1 of operation (2)
[Drawing 7] The block diagram of the gestalt 2 of operation
[Drawing 8] The liquid crystal panel unit configuration view of the gestalt 2 of operation (1)
[Drawing 9] Penetrated type liquid crystal panel unit section dustproof-structure explanatory drawing of the gestalt 1 of operation
[Drawing 10] The liquid crystal panel unit configuration view of the gestalt 2 of operation (2)
[Drawing 11] The outline basic block diagram of conventional projected type image display equipment
[Drawing 12] The liquid crystal panel unit configuration view of conventional projected type image display equipment
[Description of Notations]
100,200,300 Projected type image display equipment
101 201 Light source section
102, 202, 301 Liquid crystal panel unit
103 203 Projection lens
104 204 Screen
105 205 Light source
106 206 Reflector
107 207 Incidence side polarizing plate
108 208 Penetrated type liquid crystal panel
109, 209, 302 Outgoing radiation side polarizing plate
110, 210, 212, 304 Glass base for support
211 System Optical Axis
213 Dustproof Structure
214 High Refraction Material
215 Plane-parallel Plate
216 Aberration Amendment Glass
303 Reflected Type Polarizing Plate
305 Absorbed Type Polarizing Plate

[Translation done.]